

No. 4 ESS:

Prologue

By A. E. SPENCER, Jr.

(Manuscript received February 23, 1977)

No. 4 ESS, a high-capacity, toll and tandem switching system, is the largest single system development ever undertaken by the Bell System. It is also the vehicle by which electronic switching was first introduced into the Bell System long distance telecommunications network. During 1976, four No. 4 ESS offices were placed in service—the first in Chicago in January, the second in Kansas City in July, and the third and fourth in Jacksonville and Dallas in December.

No. 4 ESS had its origin in the 1950s in both research and planning. Research had provided the fundamental time-division switching techniques on which No. 4 ESS is based, and planning revealed that a very large switching system would be required to cope with expected growth.

Preliminary development began in 1968. By 1970, a specific plan was laid out. This plan required development of a high-speed processor, a new device interconnection technology, a digital switching network and associated transmission terminal equipment, a large body of software, new manufacturing facilities, and new installation and operating procedures.

A system as large and complex as No. 4 ESS would have been difficult (if not impossible) to achieve without the benefits of the integrated Bell System structure. Building on a background of solid research, the integrated design and manufacturing team worked with systems engineers, with switching, transmission, and device development engineers, with planners from AT&T headquarters, Long Lines, and the operating telephone companies, and with members of the manufacturing, documentation, and training and installation forces over a period of 7 years to introduce No. 4 ESS.

The advantages to the Bell System and its customers clearly justify this tremendous effort. Through No. 4 ESS, operating and maintenance costs for toll switching systems are expected to be reduced to one-third of what they otherwise would have been, building and floor space requirements will be cut to only a quarter of what they would have been,

terminal costs for digital transmission facilities terminated on No. 4 ESS will be reduced to the point that T-carrier systems will prove in at zero length, and finally, the stored program control will introduce a flexibility for new features as yet undreamed of by telecommunications customers.

In addition, the No. 4 ESS offers new opportunities for integration of switching and transmission. The switching system now reaches out beyond its normal limits to help maintain connecting transmission terminals. Furthermore, dealing with PCM multiplexed channels carrying a number of talking paths offers additional opportunities for improved performance, reduced capital expenditures, and reduced installation, maintenance, and administration costs.

This issue begins with an overview of the No. 4 ESS system and provides a brief history of the project and the background for the other papers. While omitting details, the collection of articles provides a comprehensive overview of No. 4 ESS. To limit the volume to a manageable size, the 1A Processor and 1A Technology have already been covered in a separate issue.

It is impossible to adequately acknowledge the contributions of everyone involved in a project of the magnitude of No. 4 ESS—people from many organizations of Bell Telephone Laboratories, Western Electric, AT&T, Long Lines, and the operating telephone companies all participated in important ways. The authors of this volume would like to express their gratitude to all of these people for the unity of purpose and free communication which overcame the complex organizational interfaces and technical problems, and permitted No. 4 ESS to exceed initial objectives and to be completed on schedule.